

Understanding Personal Income Tax Revenue Fluctuations

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Abstract

PIT elasticity – the growth of revenue relative to the growth of the tax base – is an important benchmark for evaluating and validating medium- to longer-run PIT forecasts. Over the last forty years the income elasticity of PIT has been volatile and pro-cyclical. It has also exhibited an underlying level of about 1.2. Consistent with this, the Department's PIT model estimates PIT elasticity to be in the 1.0 to 1.3 range, depending on the mix of real personal income growth and inflation driven growth. However, between 1994 and 1998, PIT elasticity averaged 2.1, and ranged from a low of 1.8 to a high of 2.9. This recent period of high elasticity raises questions about why modest income growth yielded such strong revenue growth, and on the appropriate benchmark elasticity to be used for fiscal planning purposes.

Deviations in PIT elasticity from its historical average and the rapid short-run revenue gains associated with them are not unexpected. They reflect cyclical movements related to the progressivity of the PIT system as well as other idiosyncratic technical factors. We decompose total PIT elasticity into its constituent components to reveal the source of these fluctuations over the 1994 to 1998 period.

The data show that within the tax system itself, the slow growth in income deductions relative to assessed income raised average PIT elasticity by 0.1, and that the partial inflation-indexation of the tax system further raised average PIT elasticity by 0.3. The data also show that measurement differences between the national accounts and Canada Customs and Revenue Agency administrative data measures of income growth raised average PIT elasticity by 0.2.

We argue that none of these factors can be considered permanent or sustainable, and that deviations in the growth in the disaggregate components of total PIT elasticity from their longer-run underlying values therefore cannot be considered permanent or sustainable. Taking the above factors into account, underlying PIT elasticity over the 1994 to 1998 period was about 1.4. Considering the cyclical position of the economy over this period, this is consistent with our estimate of PIT elasticity and its longer-run average.

We concluded that the appropriate elasticity for medium-term fiscal planning purposes is in the 1.0 to 1.3 range.

Résumé

L'élasticité de l'impôt sur le revenu des particuliers (IRP) est une donnée-repère importante aux fins de l'évaluation et de la validation des prévisions à moyen et à long termes en matière d'IRP. Au cours des quarante dernières années, l'élasticité du revenu de l'IRP a été volatile et procyclique. Elle a aussi montré un niveau sous-jacent d'environ 1,2. Ainsi, le Ministère dans son modèle de l'IRP estime que l'élasticité de l'IRP oscille entre 1,0 et 1,3, selon l'agencement de l'augmentation du revenu réel des particuliers et la croissance attribuable à l'inflation. Or, entre 1994 et 1998, l'élasticité de l'IRP s'établissait en moyenne à 2,1, variant de 1,8 à 2,9. Cette récente période de forte élasticité soulève des questions au sujet de la raison pour laquelle une augmentation modeste du revenu a donné lieu à une si forte hausse des recettes et au sujet de l'élasticité repère qu'il convient d'utiliser aux fins de planification financière.

Les écarts au titre de l'élasticité de l'IRP par rapport à sa moyenne historique ainsi que les augmentations à court terme des recettes qui leur sont associées ne sont pas imprévus. Ils témoignent des mouvements cycliques liés à la progressivité du régime de l'IRP et d'autres facteurs techniques idiosyncrasiques. Nous décomposons l'élasticité totale de l'IRP en ses composantes pour trouver la source de ces fluctuations pendant la période allant de 1994 à 1998.

Les données révèlent que dans le cadre du régime fiscal en soi, la lente augmentation des déductions par rapport au revenu évalué a haussé de 0,1 l'élasticité moyenne de l'IRP et que

l'indexation partielle sur l'inflation du régime fiscal a haussé d'encore 0,3 l'élasticité moyenne de l'IRP. Les données révèlent également qu'en raison des différences de mesure entre les comptes nationaux et les données administratives au titre de l'augmentation du revenu, l'élasticité moyenne de l'IRP a grimpé de 0,2.

Selon nous, aucun de ces facteurs ne peut être considéré comme étant permanent ou durable et les variations au titre de l'augmentation des composantes dégroupées de l'élasticité totale de l'IRP par rapport à leurs valeurs sous-jacentes à plus long terme ne peuvent donc être considérées comme étant permanentes ou durables. Compte tenu des facteurs susmentionnés, l'élasticité sous-jacente de l'IRP de 1994 à 1998 s'établissait à environ 1,4. Compte tenu de la position cyclique de l'économie pendant cette période, ce chiffre est conforme à notre estimation de l'élasticité de l'IRP et de sa moyenne à plus long terme.

On en arrive donc à la conclusion que l'élasticité adéquate à des fins de planification financière à moyen terme est de l'ordre de 1,0 à 1,3.

1.0 Introduction

Personal income tax (PIT) revenue has increased rapidly in recent years. This has occurred in the notable absence of any substantive revenue raising measures.¹ Historically, PIT revenue has grown about one-fifth to one-third faster than its underlying personal income base. In other words, the income elasticity of PIT revenue has averaged about 1.2 to 1.3 over history. However, during the latter 1990s PIT revenue grew at more than double the rate of the underlying personal income base, and PIT elasticity averaged about 2.1. Interestingly, Canada was not alone in having experienced this phenomenon. The United States also experienced a PIT revenue boom over the latter 1990s, with its PIT-to-GDP ratio rising despite actions taken under the Taxpayer Relief Act of 1997.² Aside from the question of why this revenue surge occurred, questions are also raised over the appropriate PIT elasticity to use for medium-term policy planning purposes, as PIT elasticity is an important benchmark used in evaluating and validating medium- to long-run PIT forecasts.

This paper examines the evolution of Canadian federal PIT revenue over the 1994 to 1998 period, identifies reasons for the increase in revenue, and suggests an appropriate medium-term PIT elasticity to adopt for policy planning purposes. The goal is to further the understanding of the causes of PIT revenue fluctuations as well their implications for revenue forecasting. The remainder of the paper is organised as follows. Section 2 reviews historical developments and current estimates of PIT elasticity. Section 3 identifies the sources of the high PIT elasticity, and suggests some reasons why this may have occurred. Section 4 quantifies these amounts for the 1994 to 1998 period. The concluding section summarises and suggests an appropriate PIT elasticity for medium-term forecasting and budget planning purposes.

2.0 Observations on the current PIT Elasticity

There are three main sources of information on federal PIT revenues: the public accounts, the national accounts, and the Canada Customs and Revenue Agency (CCRA) publication *Taxation Statistics*.

The public accounts are published annually, normally in the fall after the end of a fiscal year. They report on the financial operations of the Government of Canada under the control of Parliament. As such, the public accounts report PIT collections on a fiscal year basis. Under the Government of Canada's accounting policy, PIT collections are reported on cash basis of accounting, net of the Canada Child Tax Benefit (CCTB).

Of the three sources of PIT data, the most up to date and highest frequency data can be found in the quarterly national accounts. Each quarter, Statistics Canada estimates PIT collections as well as personal income—the nominal PIT tax base—and reports these amounts on a seasonally adjusted annual rate basis. National accounts estimates are updated every three months, with a lag of three months. It is on this basis and using these data that most large macroeconomic models operate. In the national accounts, PIT

¹ Excluding the partial-indexation of the tax system, a factor that had been in place since 1986.

² Richard A. Kasten, David J. Weiner, and G. Thomas Woodward (1999) *What Made Receipts Boom and When Will They Go Bust?* National Tax Journal, Vol. 52(3).

collections are reported on gross basis and the CCTB is treated as part of federal program spending.

PIT revenue and personal income data are also available in CCRA's *Taxation Statistics*, which is published annually, on a calendar year basis, with a lag of about 18 months from the end of a taxation year. The advantage of *Taxation Statistics* data is that they are the most detailed revenue data available, containing all of the information reported on the T1 tax form. National accounts data differ from *Taxation Statistics* data in that the former are designed to track the level of economic activity, whereas the latter simply track the flow of funds through the personal income tax system.

An examination of the evolution of the public accounts-based PIT elasticity will be undertaken in the next section. This analysis will be put in a longer-term context in the following section where the national accounts PIT elasticity is examined.

2.1 Evolution of the Public Accounts-Based PIT elasticity: 1994-95 to 1998-99

On a public accounts basis, net personal income tax collections increased from \$56,329 million in 1994-95 to \$72,488 million in 1998-99, an average annual increase of about 6.5 percent. (See Table 1). Over the same period, personal income has increased about 3.6 percent annually. This suggests that the average elasticity of PIT to personal income over the period was about 1.8. As can be seen in Table 1, Panel A, the annual public accounts net PIT elasticity with respect to personal income varied from a low of 0.5 in 1998 to a peak of about 4.7 in 1994.

This measure of the elasticity of the personal income tax system has a number of policy factors and errors inherent in its calculation and, consequently, provides a distorted perspective on the evolution of personal income tax receipts relative to their underlying economic base. These factors include: public accounts accounting concepts, policy changes, partial indexation of the personal income tax system, prior-year adjustments and timing factors. Therefore, adjustments must be made to net PIT collections in order to estimate underlying PIT collections for the purposes of calculating the underlying income elasticity of the personal income tax system. Each of these adjustments will be discussed in turn.

In the public accounts, personal income tax collections are generally reported on a cash basis net of the Canada Child Tax Benefit (CCTB), an income supplement to low- and modest-income Canadian families. Consequently, the first step in calculating underlying PIT revenues is to gross-up PIT revenues by the amount of the CCTB. (See panels B and C). This measure of PIT collections is consistent with the national accounts presentation where PIT revenue is recorded as gross of the CCTB and the CCTB is treated as an expense.

To move from public accounts gross PIT collections to underlying accrued collections requires four further adjustments. (See Panel D) First, the data need to be put on policy consistent basis. For the purposes of this analysis, the 1993-94 personal income tax system is considered the benchmark system. Thus, the impact of budget measures introduced

since 1993-94 must be taken into account. This is summarized in panel D.1 where a negative amount reflects tax increases and a positive amount reflects tax reductions since 1993-94. Over the period 1994 to 1997, the tax increases shown in the table below primarily reflect two measures announced in the 1994 budget: the tax treatment of employer-paid private group insurance and the elimination of the \$100,000 lifetime capital gains exemption.

Table 1
Underlying PIT Elasticity: Public Accounts Basis

	1994	1995	1996	1997	1998
A. Public Accounts Net PIT collections (Fiscal Year)	56329	60167	63282	70787	72488
Per cent change	9.5	6.8	5.2	11.9	2.4
Elasticity with respect to personal income	4.7	1.7	2.3	3.0	0.5
B. Child Tax Benefit	5286	5197	5239	5352	5715
C. Public Accounts Gross PIT Collections (Fiscal Year)	61615	65364	68521	76139	78203
Per cent change	8.8	6.1	4.8	11.1	2.7
D. Adjustments for underlying accrued PIT collections					
1. Budget measures since 1994	-155	-730	-1075	-830	190
2. Partial indexation of the PIT system	0	-610	-1220	-1830	-2440
3. Prior-year Adjustments					
a. TCA final transfer	-983	-367	163	-420	1482
b. CPP final transfer	359	-55	-159	-140	133
c. EI final transfer	358	-501	266	-469	323
d. Sub-total	-266	-923	270	-1029	1938
4. Accrual adjustments					
a. Refunds	296.5	511.5	-12	959	876
b. Payments on filing	1206.7	1071	733	653	369
c. Arrears	-490.5	405	110	81	356
d. Sub-total	1013	1988	831	1693	1601
E. Underlying accrued PIT collections (Calendar Year)	61224	64722	67490	73723	80974
Per cent change	3.1	5.7	4.3	9.2	9.8
Elasticity with respect to personal income	1.5	1.4	1.9	2.4	2.2

Sources: National Income and Expenditure Accounts, Public Accounts of Canada, and Canada Customs and Revenue Agency

Second, partial indexation of the personal income tax system distorted the underlying elasticity. The impact of partial indexation is cumulative and has been estimated to be about \$610 million per year. (See Panel D.2). As full-indexation was reintroduced in the 2000 Budget, this should have no impact on the underlying elasticity of the PIT system following the 1999 taxation year.³

³ For the 2000 and subsequent tax years, tax brackets are indexed to the Consumer Price Index for the 12-month period ending on September 30 of the previous year. As such, it is possible that there could be some increase in tax revenue due to the effects of inflation not being captured by the lagged indexing method. This

The third adjustment takes into account prior-year adjustments to the EI account, the Canada Pension Plan and the Provincial Tax Collection Account (PTCA)—the later two of which are off-budget accounts (See Panel D.3). Prior-year adjustments ensure that transfers from gross personal income tax receipts (which include federal and provincial PIT, EI premiums and CPP contributions) during a taxation year and the PTCA, the EI Account and the Canada Pension Plan equal the total amount of EI premiums, CPP contributions and provincial tax assessed for a taxation year. These adjustments are made once tax returns are assessed and final liabilities to these accounts are determined. Assessments are usually completed after the fiscal year-end but estimated transfers are made over the course of the fiscal year. In the public accounts, prior-year adjustments are recorded in the year in which they occur even though the adjustments relate to the preceding fiscal year because the accounts are prepared on a cash basis of accounting for PIT revenues.

Accrual adjustments are the final adjustment needed to recast gross PIT revenue on a public accounts cash basis to underlying accrued PIT collections (See Panel D.4). Public accounts PIT collections include refunds, payments on filing, and arrears collected at the beginning of a fiscal year during the annual tax filing and processing period. These amounts relate to tax returns filed for the previous year but processed early in the fiscal year. Therefore, adjustments are made to line-up refunds, payments on filing and arrears with the taxation year that ended in the previous fiscal year. This will result in a calculated PIT revenue amount that properly relates to the economic activity that occurred in the preceding fiscal year.

Underlying accrued personal income tax collections increased from \$61,224 million in 1994 to \$80,974 in 1998, an average annual increase of about 7.2 percent. (See Panel E). Over the same period, personal income has increased about 3.6 percent annually on average. This suggests an average elasticity of underlying accrued PIT to personal income over the period of about 2.0. As can be seen in Panel G, the annual underlying accrued PIT elasticity with respect to personal income varied from a low of 1.4 in 1995 to a peak of about 2.4 in 1997.

A comparison of the net PIT elasticity to the underlying accrued PIT elasticity shows that over the 1994 to 1998 period there are not large differences in the two measures of elasticity—1.8 and 2.0, respectively. However, there is considerably less variability in annual elasticity estimates for underlying accrued PIT collections, once timing, policy and accounting factors are taken into account.

Arguably, recently observed PIT elasticities are well above their historical average. This is examined more fully in the following section.

would require a sustained increase in the level of inflation after the end of the reference period (i.e. after September 30th), and this increase would then have to be fully reflected in wages and salaries before end of the tax year (fifteen months later). As such, the potential for this type of revenue gain is limited.

2.2 Evolution of National Accounts PIT Elasticity

The Department of Finance maintains a large macroeconomic model of the economy – the Canadian Economic and Fiscal Model (CEFM) – which is used for both forecasting and policy analysis purposes. CEFM is a quarterly, national accounts based model, similar in structure macroeconomic models used by other forecasting agencies and firms.⁴ In CEFM, PIT receipts are endogenous to the economy and calculated in a bottom-up manner, taking into account the structure of the tax system, national accounts variables for personal income, exogenous assumptions for taxable income items that are not measured in the national accounts (such as capital gains and certain components of pension income), and the distribution of total income.

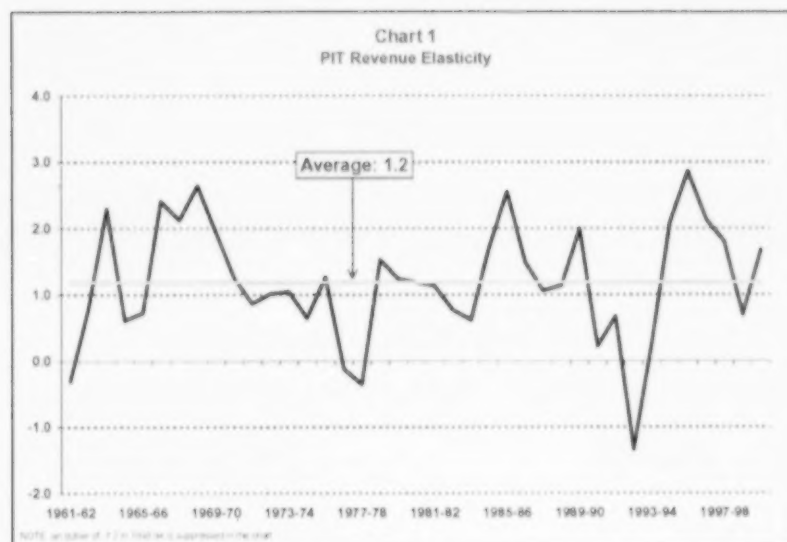
Using CEFM, we currently estimate the income elasticity of PIT to be about 1.2. Our estimate assumes that nominal income growth is split roughly two-thirds to one-third between real income growth and inflation. The elasticity estimate will actually range from 1.0 to 1.3, depending on the source of income growth: with respect to real income growth alone, the elasticity of the PIT system is estimated to be about 1.3, whereas for price-related growth the elasticity is 1.0.⁵ The greater than unitary elasticity of PIT is due largely to the progressivity of the tax system and its non-indexation for real income growth. Whenever there is real personal income growth in the economy, some individuals move into higher tax brackets, and the government collects more PIT revenue than the growth in underlying personal income would suggest.

The CEFM estimate of PIT elasticity of about 1.2 is also consistent with historical experience. Over the last four decades, the national accounts data upon which CEFM is based show that the response of PIT revenues to changes in personal income has been volatile and somewhat pro-cyclical (Chart 1).⁶ However, consistent with our estimates and expectations given the progressivity of the tax system, an underlying long-run elasticity of 1.2 is evident.

⁴ For example, the Bank of Canada, the University of Toronto, the Conference Board of Canada, WEFA, DRI and Informetrica all maintain similar macroeconomic models. For more details see, Robidoux B. and Wong B-S. (1998) *The Canadian Economic and Fiscal Model – 1996 Version: Part 1 – Model Structure*. Department of Finance Working Paper 1998-05.

⁵ Prior to the Budget 2000 re-indexation of the tax system, the price elasticity was estimated to be about 1.1.

⁶ This is not a 'pure' measure of elasticity, as the data are not corrected for the impact of policy changes, which may affect PIT revenues without affecting underlying personal income. However, as the period includes episodes of full-, partial- and non-indexation, as well as tax increases and decreases, we believe that it is on average a reasonable estimate.



More recently however, and as with the public accounts measure discussed in Section 2.1, PIT elasticity has been well above this apparent long-run level. Over the 4-year period beginning in 1994 PIT elasticity ranged from a low of 1.8 in 1998 to a high of 2.9 in 1996 (Table 2). On average, for each 1.0 per cent increase in personal income, the federal government collected 2.1 per cent in additional personal income taxes on a national accounts basis. In addition to the question of why this revenue surge occurred, a consistently high PIT elasticity also raises questions about the appropriate PIT elasticity to use for medium-term forecasting and policy planning purposes. Understanding the causes of volatility in PIT elasticity helps shed light on these questions.

Table 2
Personal Income Tax Elasticity (National Accounts Basis)

	1994	1995	1996	1997	1998	Average
(\$millions)						
PIT	58,723	63,582	67,712	73,358	79,128	
	--	8.3	6.5	8.3	7.9	7.7
Personal Income	646,684	672,423	687,708	714,643	745,919	
	--	4.0	2.3	3.9	4.4	3.6
Elasticity	--	2.1	2.9	2.1	1.8	2.1

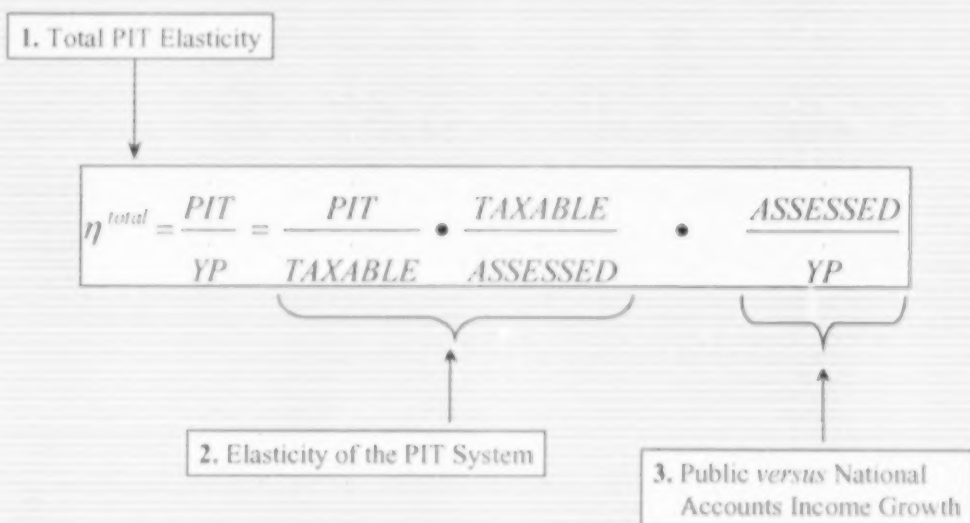
3.0 The Origins of Strong PIT Revenue Growth

An analysis of differences between national accounts personal income data and taxable income data reported by CCRA in *Taxation Statistics* suggests that one of the key determinants of the apparently high PIT elasticity between 1994 and 1998 is due

differences in measured growth rates between personal and taxable income. Nevertheless, the underlying message of the two data sources is the same: between 1994 and 1998, PIT revenue growth far outstripped what growth in its underlying base would have suggested.

To better understand the causes of this very strong growth in PIT revenue, the measured PIT elasticity can be decomposed into its constituent components. The most logical and useful decomposition of the PIT elasticity separates the measure of total PIT elasticity (Figure 1, Box 1) into two components. One component describes the elasticity of the PIT system itself (Figure 1, Box 2), and the other relates to the comparison of income as reported on tax returns to the national accounts measure of personal income (Figure 1, Box 3).

Figure 1.
Decomposition of 'Total' PIT Elasticity



Where: PIT = net PIT revenue; ASSESSSED = assessed income; TAXABLE = taxable income;
YP = personal income (national accounts). Dots above variables denote time derivative.

3.1 Elasticity of the PIT System

Within the PIT system itself, there are three important milestones as the income earned the economy and reported on the T1 tax form is transformed into an amount of net PIT revenue:

- **ASSESSED INCOME.** Of all personal income generated in the economy, only a certain portion is assessed income, or income that is subject to taxation;
- **TAXABLE INCOME.** Subtracting allowable income deductions from assessed income yields taxable income. The set of income deductions includes, among others, RRSP and RPP contributions, union and professional dues and child care expenses; and,
- **NET FEDERAL TAX.** Taxable income is mapped through the federal statutory tax rates and then the non-refundable tax credits are deducted to yield net PIT revenue. Non-refundable tax credits include, among others, the basic personal amount, EI and CPP premiums and tuition fees and education. (Net federal PIT revenue does not include other federal tax credits such as political contributions or the federal surtax.)

Together, these three income components determine the elasticity of the PIT system itself. The elasticity of the PIT system can be expressed simply as the product of the elasticity of net PIT revenue with respect to taxable income and the elasticity of taxable income with respect to assessed income. This decomposition is shown below for various historical periods (Table 3; periods of very high and very low elasticity were deliberately selected to highlight the factors that generated them).⁷

Table 3 Elasticity of the PIT System				
Episodes:		Elasticity of PIT System	Decomposed:	
		(PIT/ Assessed Income)	(PIT/ Taxable Income)	(Taxable Income/ Assessed Income)
Longer Historical Periods	1988-1998	1.2	1.3	0.9
	1975-1998	1.2	1.4	0.9
High Elasticity	1994-1998	1.6	1.4	1.2
	1984-1987	1.9	1.8	1.0
Low Elasticity	1990-1993	0.0	0.0	0.4
	1982-1983	0.0	0.0	0.4
Standard Deviation	1975-1998	0.7	0.7	0.3

First, examining a longer historical period that spans at least one full economic cycle gives a better indication of the elasticity of the PIT system when unaffected by cyclical factors. For example, between 1975 and 1998, the elasticity of the PIT system itself averaged about 1.2, which is consistent with the both long-run level of PIT elasticity shown in Chart 1, and with the elasticity estimated by CEFM. Examining the two sub-components, it is apparent that the elasticity of the PIT system is greater than unity due solely to net PIT revenue growing faster (about 1.4 times as quickly over the long-run) as taxable income. The

⁷ Data are from Canada Customs and Revenue Agency *Taxation Statistics*: Table 2, All Returns By Total Income Class. PIT revenue defined as *net federal tax*. Note that the resulting elasticity measures will differ somewhat from those presented in Chart 1 and Table 1 as those data were all on a National accounts basis. For exact taxation data definitions for Table 2, see: www.ccr-aadrc.gc.ca/tax/individuals/stats/gb96-pts/pts96-items-e.htm

elasticity of taxable income with respect to assessed income averaged just under 1.0 over the same long-run period, meaning these two variables grew at roughly the same rate. Therefore we can conclude that the greater than unitary elasticity of the PIT system arises at the latter stage of the income tax chain.

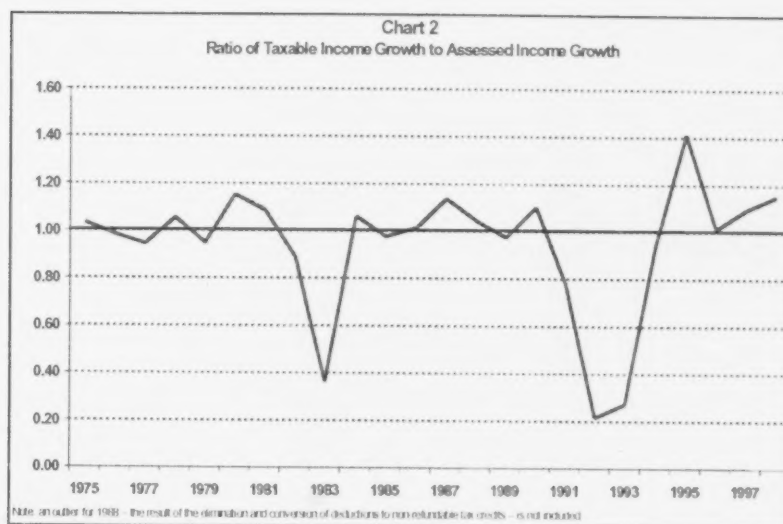
Turning to the short-run, the data reveal that the elasticity of the PIT system is higher during periods of strong economic growth, such as during the late 1980s and latter 1990s, and much lower during periods of weaker economic growth or recession, such as during the early 1980s and 1990s. The data show that the large swings in the elasticity of the PIT system that occur over the cycle arise almost exclusively through the response of net PIT revenue to changes in taxable income. The elasticity at this latter stage of the income-taxation has varied from as low as 0.0 to as high as 1.9. In comparison, the relative growth of taxable and assessed income is far more stable. This observation is confirmed by examining the standard deviation of each component over the 1975-1998 period. We therefore conclude that the cyclical of PIT elasticity also arises at the latter stage of the income tax chain.

During the current period of interest, between 1994 and 1998, *both* sub-components of PIT elasticity were higher than their 'normal' or longer-run values. We now examine the features of the tax system that may have given rise to this.

3.1.1 Why Taxable Income Growth Differs from Assessed Income Growth

The principal difference between assessed income and taxable income is the set of allowable income deductions. The growth of taxable income will differ from that of assessed income when the growth rates of these deductions fluctuate. If deductions from assessed income grow more slowly than assessed income, then taxable income will grow more quickly than assessed income, and *vice versa*. The most important of the income deductions are RPP and RRSP deductions, and so-called 'additional' deductions from net income. RPP-RRSP contributions are the larger, but are quite stable over time. They therefore tend not to cause large differences between assessed and taxable income growth. Additional deductions from net income include limited partnership losses, non-capital losses and net capital losses. These deductions are more closely tied to the performance of the economy and the stock market. They can therefore be quite volatile, and often do affect the growth rates of assessed and taxable income.

In 1992, for example, additional deductions from net income accounted for just 5.7 per cent of all deductions. In 1993, as the effects of the recession emerged in the taxation data, additional deductions grew more than eight-fold and accounted for nearly one-third of all income deductions. There was a similar (though smaller) jump in these deductions following the recession of 1981. The result was a large drop in the growth of taxable income relative to assessed income (Chart 2).



With the notable exception of recessionary periods, assessed and taxable income growth track quite closely. Deviations in non-recessionary periods do occur, but they have not been large or sustained. One such deviation occurred in the current period of interest, between 1994 and 1998. Taxable income over this period grew about 16 per cent faster than assessed income. Two things caused this.

The first factor that led to taxable income growing faster than assessed income was the 1994 elimination of the \$100,000 lifetime capital gains exemption. The cancellation of this provision resulted in a substantial increase in capital gains realisations and deductions. Underlying realisations and deductions, i.e. those unrelated to the end of the exemption and that would have occurred anyway, then fell sharply in 1995 to levels far lower than they otherwise would have been. In effect, many individuals shifted realisations forward into 1994, drawing down their pool of potential future realisations. The one-time increase in realisations and deductions related to the end of the lifetime exemption *is not* reflected in the PIT elasticity data presented here, and therefore played no part in taxable income growing faster than assessed income.⁸ However, the ensuing drop in *underlying* realisations and deductions is reflected in the data (as evident in the 1995 spike in the ratio of taxable to assessed income in Chart 2). This one time factor led taxable income to grow about 10 per cent faster than assessed income, accounting for about 2/3 of the total effect.

The second factor responsible for taxable income growth outpacing that of assessed income was a slowdown in the growth of the 'additional' deductions discussed above. The source of the expansion between 1994 and 1998 was largely the corporate sector. Corporate profits rebounded strongly from the recession of 1990-91, rising sharply as a share of GDP, and yielding strong stock market gains. The labour market, meanwhile, was much slower to recover. The concentration of the expansion in the business sector led to a

⁸ The 1994 increase was reported as a separate item in CCRA's *Taxation Statistics* and was therefore removed from the data. This does not affect the results of the analysis as these extraordinary realisations were not taxable and did not boost net PIT revenue.

slowdown in the growth of 'additional' deductions over the 1994 to 1998 period. The slower growth of these deductions led taxable income to grow about 6 per cent faster than assessed income, accounting for the remaining 1/3 of the total effect.

Together, if capital gains deductions and 'additional' deductions are excluded from the taxation data, taxable and assessed income would have grown at about the same rate over the 1994 to 1998 period, as is generally the case over longer-run periods.

One important factor not yet discussed is the effects of not only those tax policy measures that were in place over the 1994 to 1998 period, but of those that were enacted over the period. Fortunately, from the point of view of simplifying the analysis, the PIT measures enacted over the 1994 to 1998 period were not substantive (at least not as substantive as those announced in the 1999 and 2000 budgets, and the 2000 Economic Statement and Budget Update). The bulk of the measures enacted over this period were announced in the 1994 and 1995 federal budgets, and for the most part these measures were revenue enhancing. The most important included the income testing of the age credit and the elimination of the \$100,000 lifetime capital gains deduction, from the 1994 budget, and the elimination of the year-end deferral of taxation on business income, from the 1995 budget. These measures largely increased the growth of taxable income relative to that of assessed income, and therefore deserve mention in this section. However, their magnitude was not large – all together PIT measures enacted over this period had an average annual value of about \$550 million, with the actual value of the measures peaking in 1996 at just over \$1 billion. These measures did not significantly affect either the elasticity of taxable with respect to assessed income or total PIT elasticity.

Looking forward over a forecast horizon, the growth of taxable income can differ from that of assessed income, as in the period between 1994 and 1998. However, the bulk of the recent divergence was due to the response of capital gains deductions to a one-time event, the elimination of the \$100,000 lifetime exemption; the remainder was related to cyclical factors and the source of the economic expansion. In general, however, deviations in the elasticity of taxable with respect to assessed income from its longer-run level should not be taken as part of a permanent or sustainable deviation of the elasticity of the PIT system from its longer-run level.

3.1.2 Why net PIT Revenue Growth Differs from Taxable Income Growth

The volatile and sometimes high elasticity of the PIT system originates at the stage in the system where taxable income is translated through the tax brackets into a final amount of net realised PIT revenue. This occurs primarily because the federal income tax system is progressive, taxing higher incomes at higher rates. Aside from addressing equity considerations, the progressive tax system has important macroeconomic stabilisation properties. During recessions relatively fewer taxes are collected, smoothing fluctuations in aggregate income. During booms relatively more taxes are collected, mitigating the effects of rapidly expanding demand. This results in large swings in the elasticity of net federal PIT with respect to taxable income, which over the cycle has ranged from 0.0 to 1.9.

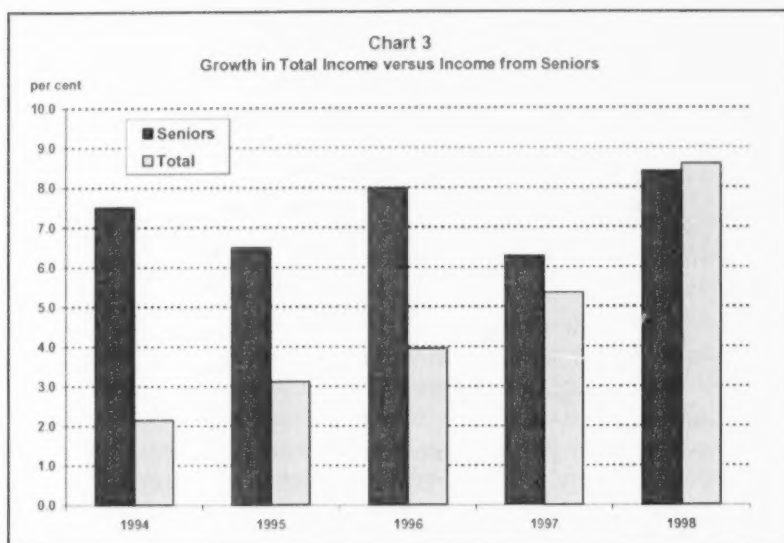
The elasticity of net PIT revenue with respect to taxable income is also affected by real and nominal bracket creep. The income levels at which statutory tax rates become effective are not indexed to real income growth. Moreover, until the reforms of Budget 2000, income tax brackets were only indexed to inflation that exceeded three per cent. As a result, any real or (less than 3 per cent) inflation driven income growth lead net PIT revenue to grow faster than underlying taxable income growth would suggest.

Aspects of Canada's social safety net have also raised the elasticity of PIT revenue with respect to taxable income. Although there were three statutory income tax brackets in place between 1994 and 1998, an individual's effective marginal tax rate was and still is often much higher due to the claw-back of tax credits and tax benefits. Credits and benefits – such as the GST Low-income Credit, the Canada Child Tax Benefit and the Guaranteed Income Supplement – are all phased-out as earned income rises. The result is steep marginal tax rates. In fact, it is estimated that more than half of Canadian taxpayers experience some difference between their statutory and effective marginal tax rates, and that more than twenty per cent have a minimum 10 percentage point difference. Almost one million Canadians, two-thirds of whom are seniors, have an effective marginal tax rate of 60 per cent or above.⁹ With high marginal tax rates, increases in PIT revenue can well exceed increases in underlying income.

High effective marginal tax rates have been an important factor in boosting net PIT revenue particularly given the high income growth from seniors during the period in question. The average annual growth in seniors' income outpaced that of total taxable income by 3.6 percentage points between 1994 and 1998 (Chart 3). There are several possible explanations for this, including the rising female participation rates of the last thirty years, the higher lifetime earnings of the recently retired, stock-market performance and a substantial increase in the uptake of early retirement packages.¹⁰ Given their propensity toward high marginal tax rates, the above average income growth from this group has yielded a disproportionately large increase in net PIT revenue.

⁹ Alan Macnaughton, Thomas Matthews and Jeffrey Pittman (1999) "Stealth Tax Rates": *Effective Versus Statutory Personal Marginal Tax Rates*, Canadian Tax Journal, Vol. 46(5). It should be noted that the bulk of seniors' high marginal tax rates arises through the income testing of one program alone, the Guaranteed Income Supplement.

¹⁰ Brian Lewis, *Ontario PIT from Seniors and Pensions*. Mimeo: Ontario Ministry of Finance, April 1998.



A change in the composition of income has played a role in raising the amount of net tax revenue yielded by each dollar of taxable income. In 1994, EI benefit payments were cyclically high due to the recession of the early 1990s. Net unincorporated business income and capital-based income, meanwhile, were correspondingly lower. The ensuing economic expansion reversed this situation: total EI transfers fell more than 42 per cent, while unincorporated business and capital-based income rose 7.4 and 5.7 per cent, respectively. To the extent that income from EI benefits yields less tax revenue than business and capital-based income (reported EI income is very likely taxed at a lower average rate than unincorporated business and capital-based income) this change in the composition of income has also raised the net PIT revenue yield of taxable income over the 1994 to 1998 period.

Technically, the major difference between taxable income and net PIT revenue is the set of non-refundable tax credits (NRTC's). Fluctuations in the growth rate of NRTC's therefore have a direct impact on the elasticity of net PIT revenue with respect to taxable income. If NRTC's grow more slowly than taxable income, then net PIT revenue will grow more quickly than taxable income, and *vice versa*.

In addition to the possibility of faster or slower growth rates, NRTC's have played a further role in boosting total PIT elasticity. The set of NRTC's were first introduced as part of the 1987 tax reform and replaced a number of income deductions. Many other income deductions were eliminated outright (Table 4). Those deductions that were converted to NRTC's were converted at the lowest taxable rate of 17 %. The conversion was revenue neutral only for individuals taxed at the 17 % rate; all other taxpayers were subject to a *de facto* increase in their effective tax rates. At the time of the 1987 tax reforms, 66 per cent of taxpayers were in the 17% bracket. However, by 1997 only 50 per cent of taxpayers remained in the 17% bracket. Therefore, there is an additional net PIT

revenue gain, via a relative reduction in the generosity of their NRTC's, as an individual's income rises and they move into a higher statutory tax bracket.

Table 4
Deductions Effected by the 1986 Tax Reform

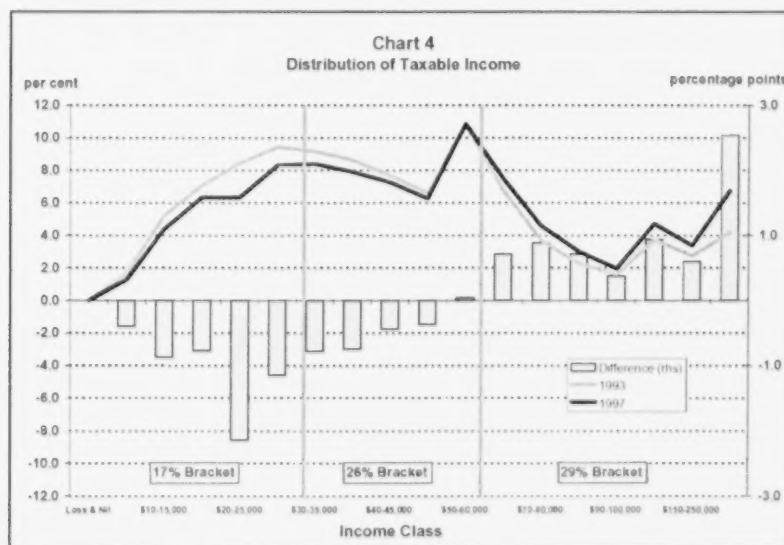
Deductions Converted to Non-refundable Credits

Single	EI Premiums
Married	Medical Expense
Dependent	CPP/QPP Contributions
Age 65 and Over	Charitable Donations
Mental or Physical Impairment	Tuition and Student/Supporting a Student
Pension Income Deduction	

Deductions Reduced or Eliminated

Capital Gains	Meal and Entertainment Expenses
Dividend Tax Credit	Home Office Expenses
Interest and Dividend Income Deduction	Employment Expenses
Automobile Expenses	

The effects of the above aspects of the PIT system can be seen in the changing distribution of taxable income (Chart 4). Between 1993 and 1997¹¹ there was a notable shift in the distribution of taxable income, away from lower tax brackets and toward higher ones. The largest declines occurred in the amount of taxable income filed at the lowest 17 per cent taxable rate, while virtually all of the gains were in the highest 29 per cent bracket. Together, all of the above factors lead net PIT revenue to grow about 1.4 times faster than taxable income over the 1994 to 1998 period.



¹¹ The closest matching years for which detailed data were available.

3.2 CCRA Taxable Income Data and National Accounts Personal Income Data

A second factor that affects total PIT elasticity is the necessity of comparing *Taxation Statistics* (or public accounts) measures of tax revenue with national accounts measures of personal income (recall Box 3 from Figure 1). The relative growth rates of personal income and assessed income, and how they affect total PIT elasticity, are shown in Table 5 below. Over longer historical periods, when the effects of the business cycle are presumably neutral, the data show that assessed income and national accounts personal income grow at roughly the same rate. Over the shorter-run, the growth rates of these two variables do differ. However, the variation does not appear to be systematically related to the business cycle: assessed income grew faster than personal income during the period around the 1990-01 recession, but more slowly than personal income during the period of the 1981-82 recession. Between 1994 and 1998, assessed income grew 16 per cent faster than personal income (for an elasticity of assessed with respect to taxable income of about 1.2). Because assessed income grew faster than the national personal income base, this also contributed to the above average total PIT elasticity recorded over the 1994-1998 period.

Table 5
Elasticity of Assessed to Taxable Income

Episodes:	Elasticity:	
	Assessed Income/ Personal Income)	
Longer Historical Periods	1988-1998	1.1
	1975-1998	1.0
High Elasticity	1994-1998	1.2
	1984-1987	1.0
Low Elasticity	1990-1993	1.3
	1982-1983	0.7

There are several reasons why the growth rates of personal and assessed income can differ. The growth rate of personal income differs from that of assessed income primarily because the two are on different accounting bases. As a result, not all sources of assessed income in *Taxation Statistics* are captured by the national accounts, and *vice versa*. For example, capital gains and pension income are not included in the national accounts, while Veterans' Allowance, Child Tax Benefit payments and Spousal Allowance are not part of assessed income. One additional factor that leads to a disconnection between personal income and assessed income is that the personal sector is not exclusively made up of people. Personal income taxes may be levied at the individual level, but not all personal income is generated by individuals. For example, the investment income received from mutual funds and insurance companies is not generated by the same individuals who pay tax on that revenue.

Differences in accounting bases cause different growth rates among income categories. Between 1994 and 1998, income growth as reported in the *Taxation Statistics* averaged 1.3 percentage points above that reported in the national accounts (Table 6). The divergence

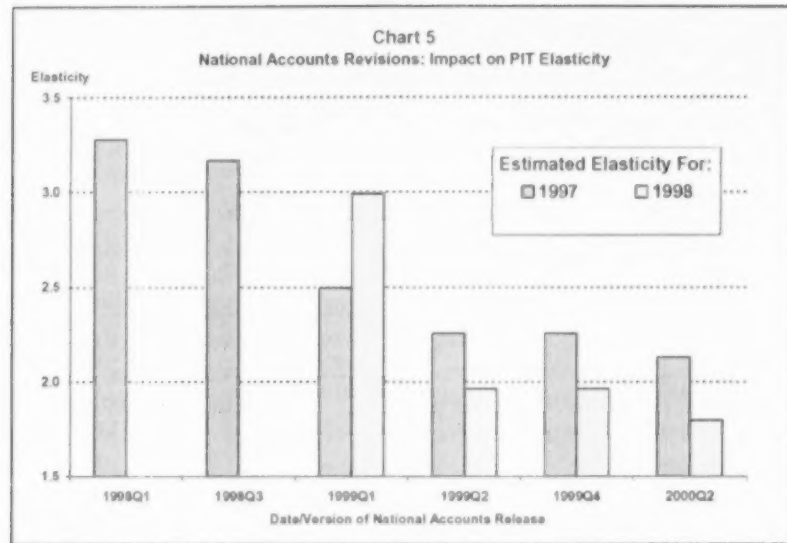
was most pronounced in the investment income category, where the national accounts fail to record capital income and certain components of pension income, averaging 2.8 percentage points over the 1994 to 1998 period. However, as investment income represents only about 15 per cent of total income, the impact on overall income was not large.

Table 6
National Accounts vs. Taxation Statistics

Income component	1994f	1995f	1996f	1997f	1998e
Wages and Salaries		(% growth, y/y)			
Revenue Canada	2.4	3.4	2.6	5.6	5.4
Statistics Canada	2.6	3.4	2.4	5.7	4.7
difference	-0.1	0.0	0.3	-0.1	0.6
Unincorp. Business Income					
Revenue Canada	7.7	6.5	10.3	9.8	2.6
Statistics Canada	6.8	3.2	6.3	10.9	5.5
difference	0.9	3.3	4.0	-1.1	-2.9
Investment Income					
Revenue Canada	0.9	1.8	8.4	5.9	6.4
Statistics Canada	0.7	9.3	0.5	-2.2	2.0
difference	0.2	-7.5	7.9	8.1	4.4
Current Transfers					
Revenue Canada	-1.2	-0.8	2.9	-0.5	3.9
Statistics Canada	0.4	0.2	0.6	1.8	4.5
difference	-1.6	-1.0	2.3	-2.3	-0.6
Total Income					
Revenue Canada*	2.2	3.1	4.0	5.4	5.2
Statistics Canada	2.0	4.0	2.3	3.9	4.4
difference	0.2	-0.9	1.7	1.5	0.8

*Excluding capital gains election/exempt income.

Recent experience has shown that national accounts estimates of income growth have tended to be revised upward to more closely match those reported in *Taxation Statistics*. These revisions have had a significant impact of estimates of PIT elasticity. The spring 1998 national accounts release indicated a very high 1997 PIT elasticity of 3.3 (Chart 5). Through four subsequent national accounts data releases this estimate, though still high, had declined to 2.3. A similar result is found for national accounts estimates of 1998 PIT elasticity. Thus, the tendency has been for the most current national accounts based estimates of PIT elasticity to be over estimated.



Over the forecast horizon, the growth of assessed income could differ from that of personal income. Any deviation will arise from either significant differences in the sources of income growth, or revisions to national accounts estimates of income growth. This first source, and the effect it has on PIT elasticity, is already taken into account in the PIT block of CEFM, and therefore does not pose a problem as far as PIT forecasting is concerned (CEFМ forecasts income from all sources, including capital-based income). However, differences that arise from income mis-measurement in the national accounts, as have occurred recently, and the impact it has on PIT elasticity, should not be taken to be part of a permanent or sustainable deviation of the elasticity from its longer-run level.

4.0 An Appropriate PIT Elasticity for Policy Forecasting Purposes

The preceding sections detailed the reasons why PIT revenue growth was so strong and PIT elasticity was so high, between 1994 and 1998. The surge in PIT receipts can be more precisely decomposed and the increase allocated to the specific factors discussed above. We do this by taking the 'naive' forecast view that at every step of the income tax chain each income component grows at the same rate as its preceding component, and then examining why it did not. Table 7 presents this decomposition, showing what net PIT revenue would have been if it had grown at the same rate as its underlying personal income base over the 1994-1998 period.¹² The difference between this naive forecast of PIT revenue and the actual level of revenue is then attributed to the two factors discussed above: developments within the PIT system, and differences between the national and public accounts measures of income.

¹² Methodology as per Kasten, Weiner and Woodward (1999), *op. cit.*

Table 7
Sources of the Growth of Income Tax Liability: 1994-1998

	Level in 1998 (\$millions)	% GDP	Share of Difference	Elasticity
A. NAIVE ESTIMATE OF TAX LIABILITY				
1. Gross Domestic Product at Market Prices	901,805	100.00%		
2. Net Federal Tax	79,134	8.78%		1.9 (actual)
3. Naive Estimate of Net Federal Tax (based on Personal Income growth)	70,701	7.84%		1.0 (naive)
4. Difference (B-C)	8,433	0.94%	100.00%	
B. DECOMPOSITION OF DIFFERENCE				
Developments in the Tax System				
1. Slow Growth of Deductions	1,531	0.17%	18.2%	1.2 (naive + 1.)
2. Non-refundable credits growing slower than Taxable Income Assessed (excluding non-indexation of basic married amounts)	1,835	0.20%	21.8%	1.2 (naive + 2.)
3. Higher Effective Tax Rate	3,682	0.41%	43.7%	1.4 (naive + 3.)
a. due to nominal bracket creep from non-indexation	2,440	0.27%	28.9%	1.3 (naive + 3.a)
b. due to real bracket creep	900	0.10%	10.7%	1.1 (naive + 3.b)
c. due to distribution of income and residual	342	0.04%	4.1%	1.0 (naive + 3.c)
Taxation Statistics versus National Accounts Data				
4. Assessed Growing Faster than Personal	1,385	0.15%	16.4%	1.1 (naive + 4.)
a. due to faster capital income growth	511	0.06%	6.1%	
b. due to other income growth	874	0.10%	10.4%	
TOTAL	8,433	0.94%	100.00%	

Source: CCRA Taxation Statistics. Authors' calculations.

Between 1994 and 1998, the PIT to personal income ratio increased from 9.5 per cent to 10.6 per cent. If the ratio had remained unchanged, PIT revenues would have been \$8.4 billion lower in 1998 (panel A, line 4). About 84 per cent this growth in revenue, \$7 billion of the \$8.4 billion total, was due to developments within the PIT system itself (panel A, lines 1, 2 and 3). The remainder, a further \$1.4 billion, was due to assessed income growing faster than national accounts personal income (panel B, line 4).

Within the tax system itself the higher than average elasticity and the \$7 billion in higher revenue can be attributed to three specific factors:

- About \$1.5 billion was due to the slower growth of deductions from assessed income;
- About \$1.8 billion was due to non-refundable tax credits growing more slowly than taxable income;
- The remainder, some \$3.7 billion, was due to a higher effective tax rate:
 - \$2.4 billion of which was due to nominal bracket creep;

- \$900 million of which was due to real bracket creep; and,
- \$300 million of which was due to the changing distribution of income.

This breakdown allows us to say more about the appropriate medium-term PIT elasticity for forecasting purposes. The data show that \$1.4 billion of the recent high revenue growth was due to measurement differences between the national and public accounts. Part of this difference – that due to the exclusion of capital and pension income in the national accounts – is modelled assuming growth in line with overall GDP growth. The other part is due to mis-measurement in the national accounts, which from a forecast perspective is equivalent to an error in the economic projection that underlies the fiscal forecast. Abstracting from this factor, total PIT elasticity between 1994 and 1998 would have been 1.7, not 1.9.

It has also been shown that deductions grew more slowly than assessed income largely due to reaction of underlying capital gains and deduction to the 1994 termination of the lifetime capital gains exemption. A full two-thirds of the slower growth in deductions was due to this one-time event. In the absence of the capital gains anomaly, deductions would still have grown faster than assessed income (due to cyclical expansion), but total PIT elasticity would have fallen further from 1.7 to 1.6.

Finally, the full inflation indexation of the PIT system announced in the 2000 budget would have lowered PIT revenue receipts by some \$2.4 billion over the 1994 to 1998 period. Excluding this amount would further lower total elasticity from 1.6 to 1.4. While this is still above our estimate underlying PIT elasticity, it is consistent with the cyclical position of the economy over this period. In fact, had there been no real income growth or change in the distribution of income, total PIT elasticity over the period would have been about 1.0.

5.0 Conclusion and Forecast Implications

The preceding analysis has shown that total PIT elasticity is highly variable and, based on the parameters of the tax system through the year 1999, had an underlying or longer-run value of about 1.2. The source of the volatility in total PIT elasticity is within the PIT system itself, at the final stage of the system. The elasticity of net PIT revenue with respect to taxable income has ranged from 0.0 to 1.9, but has a longer-run value of about 1.3. The other sub-component of the elasticity of the PIT system – taxable versus assessed income – has a long-run elasticity of about 1.0.

Deviations in the elasticity of the components of the PIT system from their historical averages are not unexpected. They reflect the progressivity of the PIT system as well as other technical factors. Over the 1994 to 1998 period, slow growth in all deductions relative to assessed income led taxable income to grow faster than assessed income, increasing the elasticity by about 0.2. The partial-indexation of the tax system resulted in net PIT revenue growing faster than taxable income, increasing the elasticity by about 0.3.

Further affecting the high total PIT elasticity between 1994 and 1998 was the fact that assessed income grew faster than personal income. Measurement differences between growth in the national accounts measure of personal income and the growth of assessed income increased the elasticity by about 0.2

Taking all of these factors into account, *underlying* total PIT elasticity between 1994 and 1998 period was about 1.4.¹³ Considering the cyclical position of the economy over this period, this is consistent with our estimate of PIT elasticity and its longer-run average.

The 1994 to 1998 period is also unique in that all the elements of the PIT system have worked in the same direction to boost PIT revenue.¹⁴ Often, the impact of one or more of these factors will be offset by another. For example, a period of strong capital based growth would lead assessed income to grow faster than personal income. But there would also likely be a surge in RRSP contributions as individuals take advantage of higher market returns. This would lead taxable income to grow more slowly than assessed income. These effects would offset and there would be relatively little net impact on net PIT revenue. However, over the last four years the impacts of these factors have reinforced each other: assessed income has grown faster than personal income, taxable growth has grown faster than assessed income, and net PIT revenue has grown faster than taxable income.

The impact of these factors acting in the same direction is also amplified because of the non-linearity of their effect on total PIT elasticity. That is, the relationship between each the individual components of PIT elasticity is multiplicative, not additive. The result has been a surge in PIT elasticity to a level well above its longer-run average.

In summary, we conclude that the appropriate elasticity for medium-term fiscal planning should be in the 1.0 to 1.3 range. This assumes income growth is split two-thirds to one-third between real and nominal growth, capital gains grow in line with GDP, other income components not measured by the national accounts (i.e. pension income) grow with inflation and the retirement-aged population, and that the distribution of income is fixed. Significant deviations from these assumptions can lead to the observed PIT elasticity lying outside the 1.0 to 1.3 range.

¹³ Data do not add precisely due to rounding.

¹⁴ A factor also shown to be present in the U.S. revenue boom. Richard A. Kasten, David J. Weiner, and G. Thomas Woodward (1999). *op. cit.*

